WORLD HEALTH

THE MAGAZINE OF THE WORLD HEALTH ORGANIZATION

47TH YEAR, NO. 1, JANUARY–FEBRUARY 1994

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Cover: J. & P. Hubley

The World Health Day logo, designed by Jean-Claude Fattier, is part of the campaign for improved oral health.

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World Health ■ 47th Year, No. 1, January–February 1994
IX ISSN 0043-8502

Correspondence should be addressed to the Editor, World Health Magazine, World Health Organization, CH-1211 Geneva 27, Switzerland, or directly to authors, whose addresses are given at the end of each article. For subscriptions see order form on page 31.

World Health is the official illustrated magazine of the World Health Organization. It appears six times a year in English, French, Russian and Spanish, and four times a year in Arabic and Farsi. The Arabic edition is available from WHO's Regional Office for the Eastern Mediterranean, P.O. Box 1517, Alexandria 21511, Egypt. The Farsi edition is obtainable from the Public Health Committee, Iran University Press, 85 Park Avenue, Tehran 15875-4748, Iran. The Russian edition can be obtained from "Meditsina" Publishing House, Petrovsvigski per., 6/8, 101000 Moscow, Russian Federation.

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READEX

Editorial

World Health Day 1994
Oral health for a healthy life

Dr Hiroshi Nakajima, Director-General of the World Health Organization.

Oral health has made remarkable progress in most developed countries as a result of prevention programmes that stress the optimum use of fluorides, oral hygiene, and the adoption of healthy eating habits.

However, the situation is beginning to deteriorate in many developing countries, where oral diseases are on the increase and treatment costs are spiralling. Yet oral diseases are not an inevitable corollary of development. We have the means to prevent this health and economic disaster: we have to ensure that these means are implemented for all citizens everywhere.

Oral diseases are not an inevitable corollary of development. We have the means to prevent both health and economic disaster. What is needed is to implement these means for all citizens everywhere.

Action is urgently needed. In the countries that have achieved sustained improvements, health policies need to be adjusted, staff have to be trained to deal with the new situation, and appropriate services have to be set up. In particular, care for the elderly should be strengthened to prevent the oral health problems linked with age. At the same time, work among children and adolescents must continue.

Launching prevention campaigns

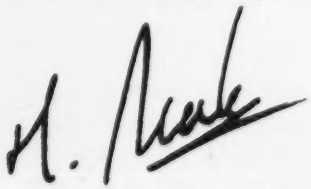
In the countries where the situation is deteriorating this trend must be checked by launching effective prevention campaigns. We must ensure that the adoption of new lifestyles and new eating habits does not lead to an increase in dental caries in populations that have always had healthy teeth. We must find ways of incorporating and encouraging the traditional methods of oral hygiene which have proved their efficacy, and which are inexpensive and culturally acceptable.

Prevention ensures healthy teeth for growing children.

Health, well-being and self-confidence are all boosted by a healthy and well-cared-for mouth, which also facilitates communication and human relations.

In devoting World Health Day 1994 to oral health, the World Health Organization is endeavouring to mobilize Member States, the health professions and the general public so that greater attention is paid to this important aspect of public health. Education and the participation of everyone are the keys to progress in oral health, without which there can be no health for all.

Let us unite our efforts so that the successes already achieved in the field of oral health can benefit everyone. ■



Hiroshi Nakajima, M.D., Ph.D.

Seal out decay – seal in a smile

Alice M. Horowitz

Applying sealant to a schoolchild's teeth in Thailand.

The use of fluorides in drinking-water, salt, milk, toothpaste and mouth-rinses has played a major role in reducing the number of cavities in the teeth of children and young adults throughout the world, especially in the industrialized world. But the problem of cavities is not over. In young people, most cavities develop in the pits and grooves of the chewing surfaces of back teeth, which derive the least benefit from fluorides.

Fortunately, such damaging tooth decay can be prevented by sealing the teeth with a thin plastic coating which will protect them from the acids formed from bacteria and food that cause decay. Unfortunately, dental sealants have been underused by oral health care providers. Too often, they are also unknown to parents and children. Yet youngsters all over the world could suffer significantly less from tooth decay if sealants were used more frequently by dentists, their helpers and community health workers with special training.

The sealing of teeth first started in the mid-1950s, when an American scientist discovered that by etching (putting a very mild acid on the tooth surface to make it rough) a bond could be established between the tooth and the plastic coating. The plastic coating seals the pits and grooves so that food and bacteria cannot get in. Today, sealants are made of plastics similar to those used in some other dental procedures, such as repairing the broken edges of teeth. They can be applied by dentists, dental hygienists, dental assistants or properly trained community health workers.

In the United States, a demonstration project was carried out which taught mothers how to apply pit and fissure sealants. In Thailand, community health workers have been specially trained to apply this protection to children's teeth. And in China, more than 25 000 children are benefiting from this procedure applied by community health workers in schools.

Portable equipment

Sealants can be applied in oral health clinics located in buildings or in mobile trailers. Sometimes the process can be carried out in schools or even outdoors in a village, using portable equipment.

The procedure for applying sealants is relatively simple. First the tooth to be sealed is isolated by a rubber "dam" or cotton rolls to keep the tooth dry. After being thoroughly cleaned and dried, the surface is etched by putting on a mild acid solution for about one minute, sufficient to create a rough surface. The acid is then washed away, the tooth is again dried, and the sealant is painted on this rough tooth surface. It takes about one further minute for the sealant to harden.

Those who can benefit most from this preventive treatment are children whose first and second permanent molars have just erupted, that is, have just become visible in the mouth. First permanent molars appear between the ages of 6 and 8 years; second permanent molars arrive between 11 and 14 years. Sometimes premolars or bicuspids can also be sealed.

It must be stressed that sealants are not a substitute for other preventive procedures such as fluorides, cutting down on sweets, and using oral hygiene. The technique should be used to complement these measures so as to ensure maximum protection against tooth decay. ■

Dr Alice M. Horowitz is with the National Institute of Dental Research, National Institutes of Health, Bethesda, MD 20892, USA.

Teeth sealing in Thailand

Yupin Songpaisan

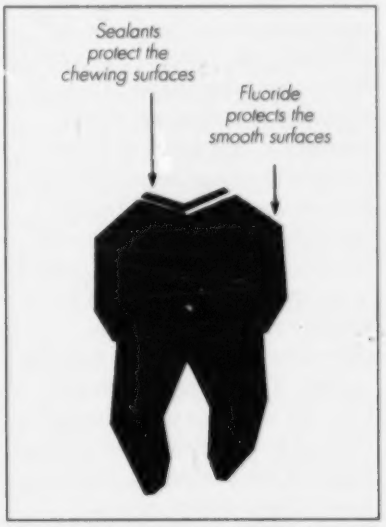
Within three days, primary schoolteachers in Bangkok had learnt how to apply caries-preventing sealants on children's teeth – and did it just as well as dentists could!

The WHO Global Data Bank shows that dental caries in developing countries has been increasing over the past 20 years. Caries on the pits and fissures of the teeth accounts for up to 90% of all caries cases in these countries. The use of pit and fissure sealants has proved to be a highly effective means of preventing and arresting this type of caries. It can be highly recommended for any Third World community where there is a high prevalence of occlusal caries, with little smooth surface caries, limited access to and use of dental care, and low social and economic status.

Although the efficacy of sealants has been well established, they are still not in widespread use because of the rather high costs. Yet a sealant programme can be very cost-effective. Factors affecting the cost depend on the material used, equipment, operators, durability, monitoring and reapplication, patient and tooth selection, and the use of other preventive measures. In developing countries where resources are scarce, some of these factors can be kept to a minimum by employing auxiliary and non-dental personnel instead of a dentist, using a mobile dental van with minimum equipment, and using cotton rolls in place of high-power suction to clear saliva from the tooth surface. Mirrors, suitable lighting and dental probes can be regarded as optimal extras.

The protective effect of sealant – usually a polymerized resin – is determined by its ability to remain firmly attached to the tooth surface. The tooth surfaces are first etched with acid and kept free from saliva during the application and setting of the material. Professional application

Molar teeth with an application of sealant.



Sealants + fluoride = maximum protection against cavities.

A schoolteacher examines a child's teeth.

in a standard clinical setting equipped with high-power suction would push the cost up comparatively, so that appropriate technologies and personnel are needed for such work in the developing countries.

Glass ionomer

The quest for a sealant material that could be simply handled with basic equipment and yet would protect against caries has highlighted the material known as "glass ionomer", a powdered glass material composed of fluoro-aluminium silicate. The main advantage in clinical use of glass ionomers is their ability to adhere chemically without the need to treat the tooth surface with acid before application. The fluoride is slowly released into the surrounding enamel to help prevent caries. Even if the sealant becomes detached, the preventive effect continues since the remains of glass ionomer are still fixed in the fissures of most of the occlusal surface. Reapplication of the treatment and monitoring, which would require trained personnel, is thus avoided.

New teaching and learning approaches, with simulation techniques, now make it possible to train personnel effectively and rapidly to provide this treatment, and the sealant can be applied by non-dental personnel after only a few days of training.

A national oral health survey in Thailand in 1989 indicated that 12-year-old children had an average of 1.5 decayed, extracted and filled teeth, and 77% of these teeth needed restorative care on occlusal pits and fissures. So a project was started to treat primary schoolchildren in Bangkok – a typical example of a city in a developing country experiencing ever greater caries prevalence. The fact that untreated active fissure caries lesions may result in the total destruction of the affected tooth motivated intensive efforts to solve the problem.

Six primary schoolteachers were trained by a dentist during a three-day course. The first day dealt with general knowledge of tooth anatomy, caries and oral hygiene instruction. On the second day, the teacher-pupils learnt to handle, mix and apply glass ionomer sealant on plaster casts of teeth. The third day saw the teachers practising applying the sealants on children, and each teacher treated about six teeth at this session.

The course took place in schoolrooms, using simple, portable dental apparatus. Air blowers operated by a foot pump sufficed to control excess saliva, in addition to cotton rolls. Two schoolteachers acted alternately as operator and assistant in mixing and handling the sealant material.

As good as the dentist

The study demonstrated that schoolteachers given this brief training could apply the treatment just as well as the dentist. Although only a small percentage of the sealant remained in position when the children's teeth were checked six months later, a significant reduction in caries was observed after two years, particularly among the younger age group.

The schoolteachers who took part enjoyed the training and appreciated being able to give oral care to the children. They also had a better understanding of the importance of early prevention of caries. The schoolchildren too cooperated well and took better care of their oral hygiene.

This type of sealant lends itself to extensive use in developing countries, but further studies are still needed to develop better fluoride-releasing materials that will be easy to handle in all types of climate, simple to apply, and adhere properly to the tooth surface.

In a community at high risk of caries, sealants should cover pits and fissures on occlusal and other tooth surfaces, especially in newly erupted first and second permanent molars. Fissure sealants should be used in combination with other methods for preventing and treating occlusal caries, such as insisting on regular oral hygiene and the use of toothpaste containing fluoride. ■

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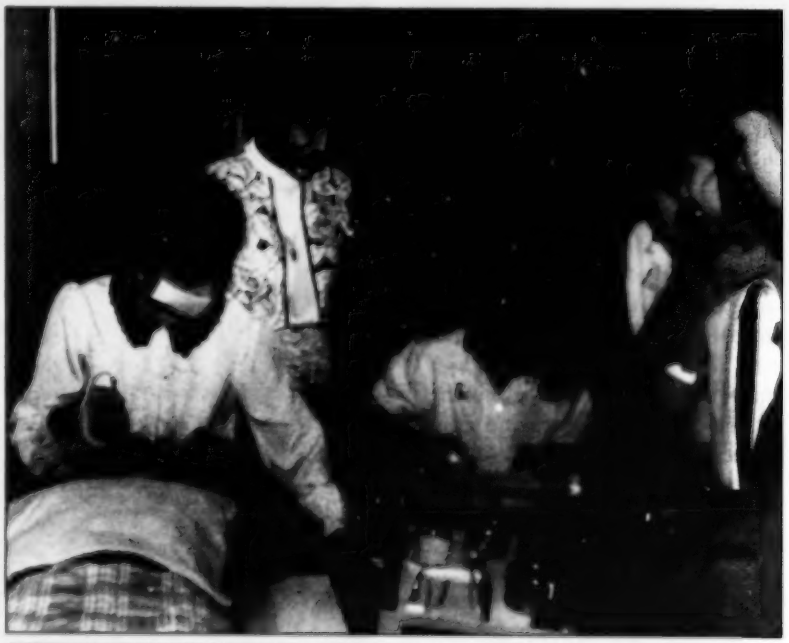


Sealants are mixed ready to be immediately applied by the schoolteacher.

Fluoridation at community level

T. M. Marthaler

Once it was realized that fluorides have a caries-preventive action, the fluoridation of communal water supplies became standard practice over large areas of the world. Adding fluoride to salt and even to milk supplies has an equally beneficial effect.

One of the important achievements of food technology was modern refining of sugar, both from cane and from beet. Between 1870 and 1910 sugar became a cheap foodstuff, well accepted for its sweetness, available in many forms and useful as a food preservative. However, the then unknown consequence of this easy access to sugar was a strong increase in the carious destruction of teeth. By the 1930s and 1940s epidemiological surveys showed a high prevalence of caries in North America, north-western Europe, Australia and New Zealand, while in less industrialized nations and remote populations the prevalence was still low but often rising.

Advances in dental research have shown that all fermentable carbohydrates, including sugar, contribute to the development of dental decay. Dentistry was unable to cope with the pace of dental decay and many experts looked desperately for preventive procedures to improve the situation. Toothbrushing, it is true, was encouraged, but dietary recommendations varied widely. At that time, scientific bases were few and unreliable, and the caries-preventive action of fluoride was unknown.

This was the situation when research in the United States and Canada convincingly demonstrated that water fluoridation is an effective and very cheap means of lowering the prevalence of caries. In the early 1950s, this method was called "mass prevention of dental caries". This description is accurate: 120 million of the 250 million population of the USA (1989) benefited from this measure, 25 million in Australia, Canada, Ireland and the United Kingdom, and many millions more in other countries.

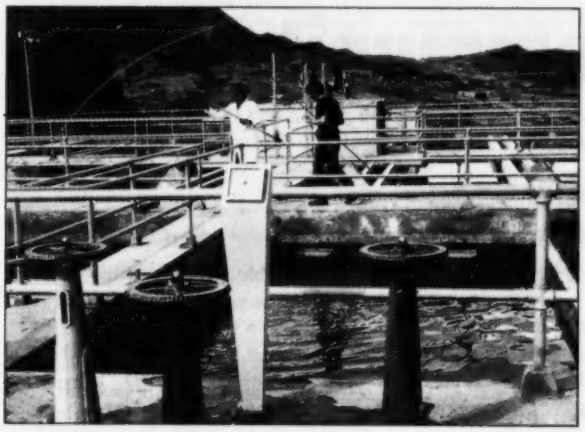
Water fluoridation is most useful in countries or regions with centralized water systems, or in city states like Hong Kong where coverage of the population is virtually total. But the majority of mankind, particularly in the developing world, has no access to large-scale drinking-water systems. Of course, in a few areas of the world, the natural water supply may be high in fluoride. In excess, such fluoride can even be damaging to both teeth and bones.

Healthy food: good for your heart and arteries . . . it is essential for oral health as well.

Inhibiting caries

Drinking of fluoridated water acts systemically, whereas fluoride in dentrifices is applied topically, i.e., the fluoride is in direct contact with the teeth in the mouth, but is not intentionally ingested. The distinction systemic versus topical, however, has narrowed for the following reasons.

- Until about 1960 ingested fluoride and its accumulation in the developing teeth was considered to be the main mechanism for the protective effect against caries. Since then, fluoride in water has been found to have a topical effect



Fluoridation of public water supplies.

Fluoride preventive treatment at a school in the Seychelles.

in preventing caries of tooth crowns and even of roots where they are exposed due to gum recession, especially in old people. This topical effect is now documented as the most important preventive mechanism.

- Fluoride in dentifrices has obviously a direct protective effect against caries of the erupted teeth, i.e., teeth that have emerged from the gums as children grow. However, a small fraction of the fluoride contained in dentifrice is swallowed during and after toothbrushing. Small children may swallow one-fourth to one-third of the dentifrice, and the ingested fluoride may provide additional effects even before tooth eruption.

Imagine a country which produces its own edible salt from natural resources at, say, three sites. The bigger the country the better, because it is naturally more cost-effective to build three fluoridation units for a population of 30 million rather than for only three million. Brazil is such a country. North of 20°S latitude there is an immense "Amazonian" area having a population of some 70 million. Through the salt consumed there, every individual in an area measuring about 3600 km east-west and 1800 km north-south can be provided with the desired small amount of fluoride – a supplement of 1–2 mg of fluoride per day – at practically no cost. For the 70 million inhabitants, 300 tons of a soluble fluoride compound per year need to be added to some 160 000 tons of edible salt; the supply of the fluoride compound is easily dispatched in a few small shiploads.

Safe and easy prevention

The easy distribution and extremely low cost of salt fluoridation raises hopes for those developing countries in which salt production and distribution is centralized. If handled properly, salt fluoridation will have a similar impact on oral health as water fluoridation: safe and easy prevention of dental caries in tens or hundreds of millions who – if they suffered from dental caries – would have little or no access to modern dental treatment.

In many ways, salt fluoridation is similar to water fluoridation. The fluoride vehicle – water or salt – is ingested virtually every day by everybody. However, controlled trials were begun only in the mid-1960s, in Colombia and Hungary. Based on the predominant topical effect, it is not surprising that the studies showed water and salt fluoridation to be equally effective.

At present, many details regarding salt fluoridation are being studied. When compared to the impressive amount of research data on water fluoridation accumulated during 50 years of research, investigations on salt fluoridation are still comparatively few. Nevertheless, most conclusions drawn from water fluoridation research are also applicable to salt fluoridation: once the solid or liquid food is in the mouth, it mixes with saliva and the fluoride prevents caries whether it originates from water or from salt. In addition, the ingested fluoride is metabolized in the same way, the greater part of it being excreted in the urine.

Several techniques for fluoridating salt have been developed and are in use. The process must fit into the existing salt production plant and therefore needs careful planning. Ensuring that the concentration falls within required limits (220–280 mg of fluoride per kg of salt) needs monitoring at the production site as well as in samples taken from the packaged product as it is sold.

Treating milk and school water

The idea of fluoridating milk had considerable appeal once the efficacy of water fluoridation became known. In fact, most children in the industrialized countries drink milk with remarkable regularity. Research in oral biochemistry revealed that, because of the high calcium content of milk, absorption of fluoride is slower from milk than from water. The beneficial effect in stopping the development of caries has been established in several trials. A special technical apparatus has been developed for milk fluoridation, and the process is usually linked with schemes of milk distribution at school. This is done also in some developing countries to provide children with certain essential nutrients such as calcium and protein.

School water fluoridation was

developed as an alternative to general fluoridation of the water supply where the latter was not feasible. It protects the permanent teeth which erupt between the ages of six and twelve, mainly by its topical efect. Up to now, this procedure and research into it have been limited to the USA.

The daily intake of 1 mg of fluoride after the age of six years (smaller amounts are given to children up to five) is well established as an effective means of preventing caries. While the success of this procedure in those families who adhere to the necessary discipline is well documented, the public health value was found to be small. In many schools throughout the world, the tablets were distributed daily. Such schemes lasted for years, but rarely for decades. Like fluoridation of milk or school water, fluoride tablets may be useful in special situations. But these three methods have limited significance for nationwide public health programmes.

While the daily practice of toothbrushing with a dentifrice relies on the individual, the users of fluoridated dentifrices are in fact the largest community to benefit from fluoride. Their number exceeds a thousand million, which is far above the numbers reached by other fluoridation methods. The beneficial effect has been proved, both on the experimental and the population level. Fluoride dentifrices are the only common cause of the dramatic decline in the prevalence of dental caries which is evident in many highly industrialized countries.

Where there is systemic administration of fluorides by milk, water and tablets, children should start to use fluoride-containing dentifrices at least by six years of age. Recent epidemiological surveys indicate that fluoride dentifrices combined with water or salt fluoridation, both of which provide additional topical fluoride throughout life, impart substantial benefits not only for children, but also for adults. ■

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Preparing a fluoride solution in Venezuela.

Using fluoridated toothpaste every day offers sound protection against caries.

What to do?

1. *Clean your mouth.*
   Do this well once or twice every day. To remove the plaque from your teeth and gums, use a toothbrush or a chewstick – and whenever possible, use fluoride toothpaste. If you have crowns or bridges you also need to use dental floss or interdental brushes to clean between your teeth. These are the basic measures of oral hygiene.
2. *Use fluoride.*
   Fluoride is a mineral found naturally in many foods and in most sources of drinking-water. It inhibits the ability of bacteria to produce acids, strengthens the enamel of your teeth, and makes them more resistant to decay. When fluoride levels are below optimal, use fluoridated toothpaste. In addition, either drink fluoridated water or milk or use fluoridated salt in cooking and have it available on the table for use with food. If none of these is available, use fluoride tablets or rinses. Fluoride protects teeth throughout life, but it especially protects the teeth of children.
3. *Eat less sugars.*
   Use sugars intelligently. You can safeguard your teeth by eating less sugar-rich food. Or by balancing with other food. Don't let snacks take the place of a well-balanced diet; nutritious foods are essential for oral health as well as for overall health. If you really need to nibble between meals, the best snacks are those that contain no fermentable carbohydrates.

Oral health begins at primary school

Patrick Hescot & Hervé Caron

Boubou, a comical little hippopotamus, goes to school where he meets all his old chums, the other animals from the jungle. After fooling about on the way to school, they are now behaving themselves and paying attention to the lesson that their schoolteacher, a giraffe, is giving. She tells them to brush their teeth well, and of course it is much easier and more fun when you do it to music. So everybody repeats the verses and the chorus of the song, while pictures are projected on the classroom wall. That makes it easier to remember that we must brush the upper and lower teeth separately, that we concentrate on one side at a time, and that "we'll brush all our teeth, right down to the big ones at the back."

It was a dental surgeon who came to our school to teach us this song – "Do you know how to brush your teeth like Boubou does?" – and a lot of other things about taking care of them. Because when you are between your fourth and eighth birthdays, if you want to have fine strong teeth all your life, you already have to learn to take them seriously. And since you've already seen plenty of advertisements for toothpaste on the television, you already know quite a lot and are quite happy to put questions to the visiting dental surgeon.

You can even practise the movements he taught you with a big model of a jaw and a giant toothbrush, because he left behind with the schoolteacher a poster, some leaflets and – for everyone – a little bag with a cup, a toothbrush and a tube of toothpaste.

Another place, another time

This morning, a big lorry arrived and could only just find room to park in the schoolyard. A very special lorry because it is laid out like a real dentist's consulting room, with a waiting room, a dental chair, lighting, compressed air, instruments for inspecting teeth and – of course – everything needed for sterilizing the instruments. This lorry has criss-crossed France for a month, calling at a dozen towns in the course of an operation called Dental Health Month.

Carried out under the auspices of the French Union for Oral and Dental Health and a well-known brand of toothpaste, the campaign is in its second phase. This consists of case-finding, and using audiovisual aids to put across the messages of prevention and oral hygiene, as well as distributing to every schoolchild a kit containing a toothbrush and toothpaste, brooch-pins and a strip cartoon.

A dental surgeon and an educator have shared the work to make sure that teeth inspections, case-finding and health education are all carried out under the best possible conditions.

The French Union was created more than 25 years ago by the dental profession, and concentrates on promoting, motivating and

The giraffe gives his jungle friends a lesson in oral hygiene.

coordinating the various efforts in favour of oral health, but particularly on researching and introducing various new means for detecting and preventing oral and dental infections. The Union groups together 15 000 dental practitioners and acts in partnership with the social security services, friendly societies, the community health and sanitation services, the education authorities, and pharmaceutical laboratories. Its mission was formally recognized in a ministerial circular letter, which opened all the nation's school doors to its officials. So the Union now has access to all of France's primary and secondary schools through its committees scattered throughout every *département* (county) in the country. ■

Dr Patrick Hescot is President of the French Union for Oral and Dental Health, and Dr Hervé Caron is a fellow-worker with the Union, whose headquarters are at 92, avenue de Wagram, 75017 Paris, France.

This colourful kit makes it fun to brush your teeth.

Schoolchildren in Mali learn good brushing techniques from a large-scale model. (See article next page).

Common oral disease problems

In our mouths there are billions of living bacteria. Most of them are harmless, some even helping the digestion of our food. Dental plaque is the soft white or yellow layer that sticks to the teeth. Plaque is mainly bacteria but it also contains remains of saliva, cells of the mouth tissues, and fibres from food. Some of the bacteria that grow in the mouth cause tooth decay and gum disease. They produce different substances that change the enamel or the tissues that hold the teeth.

Plaque builds up where the gum meets the neck of the tooth, in the grooves of the chewing surfaces of the teeth, and in the narrow spaces between the teeth. Plaque is found in everybody's mouth, but some have much more than others. These people are more likely to develop gum disease and tooth decay.

Dental caries: The bacteria in the plaque produce acids from food we eat; these acids attack the tooth enamel and cause caries. The bacteria grow and produce a lot of acid very quickly if they are supplied with sugar.

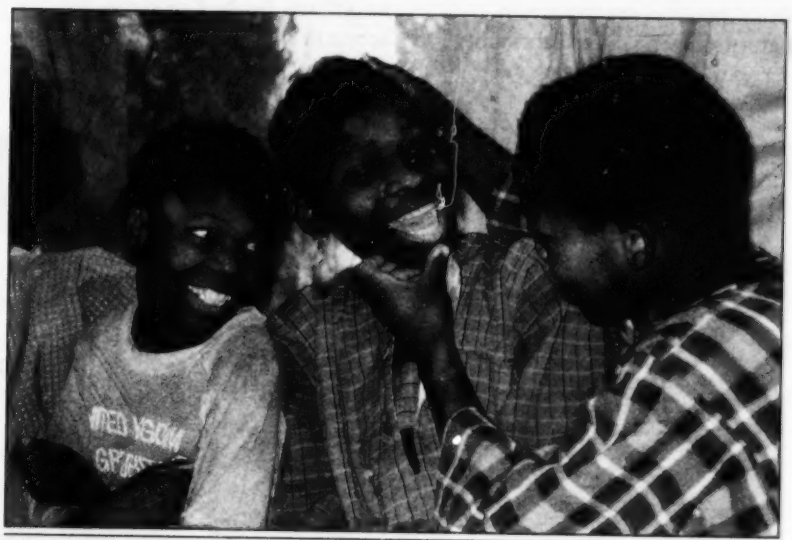
If extractions are to be avoided, caries must be prevented from starting or, when present, must be treated with a filling. Most dental caries occurs in children and young adults. Older people mainly have caries of the root and problems with replacement or repairs of fillings.

Inflamed or bleeding gums: Gingivitis or inflammation of the gums usually begins in the gums between the teeth. Most people develop gingivitis at some time in their life. Bacteria in the plaque are the cause of the disease. If plaque is removed every day thoroughly, the gums will become healthy after one week. Bleeding from the gums is a common sign of gingivitis. Periodontitis is a serious bacterial infection of the tissues and bone around the teeth. The bacteria attack the fibres that hold the teeth in the jaw. When this happens a gap forms between the teeth and the gum. This gap is called a periodontal pocket. The pocket fills with debris and bacteria which cause further damage. The fibres that hold the teeth are gradually destroyed, and the teeth become loose. Periodontitis is a problem of older adults, but is much less common than gingivitis.

Calculus: If plaque is not removed for a long time it hardens into calculus. Calculus makes cleaning the teeth and gums very difficult – so it should be removed by a trained oral health worker.

Oral health in Mali's schools

Jacques Abellard



Children readily become enthusiastic about dental care.

A study in Mali in 1990 showed that, according to WHO's recommended criteria, 90% of children aged 12 have poor oral hygiene – allowing caries and other oral diseases to develop unchallenged. The scarcity of hospital structures and qualified personnel as well as the high cost of curative treatment means that they have almost no access to the care they need.

In view of this situation, a programme was started by International Odontological Aid, a Paris-based agency, in collaboration with the Ministry of Health of Mali, in the region of Mopti, lying by the River Niger some 650 kilometres from the capital Bamako. The object of the programme was to teach daily hygiene to children while giving preference to traditional methods, such as using special sticks as toothbrushes (see photo on page 28). The programme's thrust was aimed at raised awareness of the problems among schoolchildren, because they would spontaneously transmit the educational messages to those around them, whether younger children or adults.

In each class, matching groups of a maximum of 20 children are trained by the health animator and by their own teacher. Two sessions are arranged a week apart. During the first, the children learn about oral diseases by inspecting each other's teeth and mouths and are helped to understand the causes of such infections and their consequences on health, how to prevent them, and what health care is available locally. During the second session, each child learns about good habits that can improve oral health. Whatever resources are needed for these classes are found in the locality concerned.

Drawings displayed on a blackboard or felt-boards help all the children to discover for themselves what each session is about. The health animators act as helpers rather than instructors. They guide the children through each session by asking appropriate questions, making sure that every child takes part so as to become personally aware of the problems of oral health. The children become actors, and together they make up a story with a moral which will drive home the messages of good hygiene.

The teachers, whose role is to ensure that this knowledge is kept up to date, are issued with a manual on oral health. They are involved from the start of the course, reinforcing the lessons acquired.

Evaluation of the results shows that in the course of the school year 1992–93 some 3000 schoolchildren aged between seven and twelve have benefited from this preventive action. In addition, about 5000 children who are not yet at school have learnt about oral hygiene from the older ones. An even more telling result is that 1100 children have gone for dental check-ups at the Mopti hospital as a consequence of these awareness sessions.

Schoolchildren in one district of Mali have reacted enthusiastically to special classes aimed at alerting them to the value of hygiene in preventing future oral health problems.

The programme's impact is regularly evaluated by checking on the knowledge acquired, by periodic oral examination and by recording how often the children attend oral health consultations. Experience in the field has confirmed the enthusiasm of both children and teachers for this initiative. As a result, with effect from 1994, a further 40 schoolteachers will be trained and this will enable the programme to reach another 7000 children in Mali. ■

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Love Your Teeth Day

Bian Jin You

Each year, China celebrates 20 September as Love Your Teeth Day, with massive campaigns to raise awareness about self-care in oral health. This event, tested in four model areas for community programmes on oral health care, has already brought about remarkable progress.

Health is not complete without oral health, and Health for All by the Year 2000 can only be achieved through the medium of the primary health care approach. There is, in fact, a close relationship between oral health and the essential elements of primary health care, since health education – as the first component and initiative – will bring both together.

The Chinese government recently integrated Health for All firmly within the state plan for social and economic development in the near future. A complete system of primary health care has been established. In a population of about 1200 million, of whom nearly 900 million live in the rural areas, this system covers 790 million people or 66% of the total. With the assistance of the WHO Collaborating Centre for Research and Training in Preventive Dentistry in Beijing, a first rural community care model for oral health was developed in 1984 in Yuncheng. Since 1988, when the Ministry of Public Health established the Chinese National Committee for Oral Health (CNCORH), a further three models have been started.

About the same time, a massive national campaign called "Love Your Teeth Day" has been celebrated on 20 September each year. This campaign started in the municipalities and capitals of provinces and cities, and has gradually spread to the rural areas year by year since 1989.

The common aims of these two important activities are to provide essential oral health care within primary health care to all members of the rural community involved, and to promote popular awareness of self-care in oral health and of community involvement in oral health education programmes. Using these two approaches, oral health care is being provided to the people in their own communities in both rural and urban areas, and using different methods that are adapted to fit their lifestyles.

Look how easy it is to brush your teeth!

Rural infrastructure

In the traditional Chinese rural infrastructure, a county is relatively independent, and has a fairly complete social structure in which the health care delivery system consists of three levels – village, township and county.

At the village level, there are two or three village doctors as well as health workers and midwives, who work together in each village health station; 88% of the villages are now covered. In the model areas, at least one member of the team is trained as a primary oral health worker to provide examinations, oral hygiene instruction, preventive advice and prophylaxis to the villagers.

At the township level, an oral health unit operates within a community health centre, with at least one doctor trained for up to one year by an oral health team from the nearest oral health centre and dental school. These doctors' responsibilities are to provide appropriate treatment of common oral diseases, such as filling teeth, pulp intervention, extracting teeth and making removable dentures, as well as advising, monitoring and evaluating the quality of primary oral health care.

At the county level, there is a department of stomatology affiliated with the county general hospital or county health centre, with between three and fifteen oral health personnel, including dentists, nurses and technicians. They are responsible for providing comprehensive oral health care to the public, together with technical guidance, manpower training, and community programmes related to oral health in the county.

Four county-based community models – Yuncheng in Shanxi Province (1984), Linkou in Helongjian Province (1986), Wuyi in Zejiang Province (1988), and Zelimomen in Inner Mongolia (1988) – were set up by the health authorities. The infrastructure is similar, though there are some differences in the way manpower is trained, in facilities and equipment, and in funding.

The Love Your Teeth Day campaign went into its fifth successful year in 1993. After each Day two types of questionnaire are sent to members of the public and to the organizers respectively, which are then returned for data processing. These data are used to evaluate progress.

Better oral health

The results show a remarkable improvement in oral health status, especially among rural children living in the model areas. The percentage of people with caries fell from 49.8% (1986) to 38.7% (1990), the average number of decayed, missing and filled teeth dropped from 0.97 to 0.67, and the fillings rate increased from 0.1% to 11.7% at 12 years of age. The percentage of people who regularly brush their teeth increased to 67.4% in 1990 compared with 13.5% in 1984 in Yuncheng, and reached levels of more than 80% in other target areas. Data from Yuncheng also indicated that the percentage of people with healthy gums increased from 1% to 37%, gingivitis dropped from 99% to 63%, and calculus decreased from 85% to 43% at 15 years of age.

The numbers of oral health personnel in these model areas increased rapidly. The ratio of oral health personnel to the population changed from 1 per 120 000 (1980) to 1 per 8000 (1990) in Yuncheng; from 1 per 32 000 (1986) to 1 per 6100 (1990) in Wuyi; from 1 per 8400 (1985) to 1 per 6700 (1989) in Linkou; and from 1 per 130 000 (1980) to 1 per 17 000 (1990) in Zelimomen.

The findings from a four-year study of Love Your Teeth Day indicated that the activities which started in 1989 in three municipalities, 26 capitals of provinces and some large cities had by 1992 spread to most cities in the urban sector and to about 300 counties in the rural sector. Some 14 000 oral health personnel and health workers participated as providers of information in 1989, but this total increased to 40 000 in 1992. As a result, oral health knowledge – assessed at 37% in 1989 – rose to 76.2% in 1992.

These community models are still developing, and the big challenge is to increase the proportion of the population covered by oral care services. It is too early to judge the eventual success, but certainly much progress has been made. Whether such improvement can be maintained and extended will also be assessed. It is foreseeable that the Love Your Teeth Day campaign, as an initiative, will play an important role in pushing forward achievement of the essential goal of primary oral health care for all Chinese people by the year 2000. ■

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Health education through play-acting.

A treatment technique for tooth decay in deprived communities

Jo Frencken & Fiona Makoni

This folding bed, specially built for dentistry, is made locally and weighs about 15 kg.

No more equipment than this is necessary for applying sealants and carrying out fillings.

A technique tried out with success in Zimbabwe called Atraumatic Restorative Treatment suggests an effective way of bringing good quality oral health care to rural and outer-urban communities elsewhere in Africa.

During the seventh international conference on dental research, held in Harare in December 1992, Dr S. Thorpe of the WHO Oral Health Programme in Brazzaville stated that more than 90% of tooth decay in Africa goes untreated. If we look at the oral health situation prevailing amongst 15-year-olds in Zimbabwe, we see that they have on average 1.5 decayed teeth. Of all those decayed teeth only 7% have been treated. The untreated teeth are just left to decay further until they hurt and have to be removed. This shows the great discrepancy which exists between the presence of disease (tooth decay) and its possible treatment (fillings).

What are the reasons for the lack of care in this and other African societies? A mixture of the following factors are considered to be responsible: inappropriate dental curricula for the African setting; inadequate numbers and distribution of oral health personnel; inadequate financial resources allocated by governments; inadequate supply of dental equipment and materials; low awareness of oral diseases by the population; and little or no involvement of communities in promoting oral health and providing oral health care.

In Zimbabwe, as in many other African countries, most oral care is provided in dental surgeries, but these are predominantly found in urban areas. In a few places, care is provided through outreach programmes which usually involve extracting badly decayed teeth and offering oral health education, that is, emergency care and health promotion activities. Rarely is any treatment provided at an early stage of disease, nor are any preventive measures taken.

Why is it difficult to incorporate an element of cure into community oral health programmes? After all, the provision of curative care for common diseases is one of the elements of the primary health care approach. The answer lies in the training of oral health personnel. Traditionally, oral care and education rely heavily on modern technology, particularly electrically driven equipment. This machinery-based type of care was introduced in the early part of this century in the now industrialized countries to assist dentists in mastering an uncontrolled rate of tooth decay in their communities. But over the last two decades, an enormous amount of oral health-related research and promotional activities has been carried out and has resulted, amongst other achievements, in a decrease of tooth decay in the industrialized world.

A new concept

So a new thinking has developed involving a shift from the concept of "disease" (filling holes in the teeth) towards the concept of "health" (trying to preserve teeth and gums through small interventions and oral health promotion activities). This new thinking is taken for granted amongst oral health personel in the industrialized world, but it is still based on modern technology.

So the question is now raised: Do we really need electrically driven equipment to deal with all tooth decay? In other words, is it possible to develop a technique which takes into consideration the results of research on the processes of oral disease and on improved filling materials, and which at the same time is based on the philosophy of "health" rather than "disease"? Such a technique would allow for an element of cure, besides emergency care and oral health-promoting activities, within primary oral health care programmes for rural and outer-urban communities in Zimbabwe and other developing countries. Experiences in using mobile dental equipment in the African setting have shown that such equipment is not cost-effective at all and, after some time, can be seen lying idle.

This reinforces the need for developing a treatment technique that is both appropriate and of good quality.

Such a technique would improve the oral health not only of people living where electricity is not available but also those who live where there is electricity but where nobody can afford to buy and maintain expensive dental equipment. After the technique was introduced to private practitioners in Zimbabwe, some have found it to be a big step forward in treating children since it largely eliminates the concept of fear while still providing good quality care.

The technique that has been developed is called Atraumatic Restorative Treatment (ART), and is

A comfortable position for both the operator and the young patient, and simple, effective equipment.

based on cleaning the hole in the tooth by removing soft tooth material using a small hand instrument and, after cleaning is completed, filling the cavity with glass-ionomer cement. This filling material sticks to the tooth surfaces and makes the tooth stronger than can be done by any other type of filling material. Cotton pellets are used to clean the cavities in teeth, and cotton rolls to control the saliva and keep the teeth dry during treatment. If the patient complains of pain during cleaning, a local anaesthetic can be administered. A head lamp powered by a small portable battery provides lighting.

The DMF tooth index

This is a count that makes it easy to measure and compare the level of dental caries in a community. It is the total of Decayed, Missing and Filled teeth. The global goal for the end of this century is a DMF tooth index of three or lower at 12 years of age. In the 1960s, the index averaged less than one for most Third World countries, and up to 12 for some industrialized countries. Figures reported in 1993 show a sharp reversal of trends: 2.08 for developing and 3.17 for industrialized countries.

Encouraging results

Researchers from the Netherlands, Thailand, and Zimbabwe are carrying out a three-year field trial on the cost-effectiveness of the ART technique in a village community in Thailand. The evaluation results, which have been presented at scientific meetings, are very encouraging (see article on page 5). After one month, only two children remembered having had pain after treatment, whereas 97% of the children and adults were pleased with the treatment they received. Clinically, 86% of the fillings on the chewing surfaces, where the decay was mainly located, were judged successful after two years. In the 13-year-olds and over, the success-rate was higher (91%) than in the 6- to 12-year-olds (83%).

In Zimbabwe, the incorporation of this treatment technique into the primary oral health care concept was considered a big step forward in the government's endeavour to improve and extend oral health care to a much greater part of the population. A demonstration programme was developed which focused initially on 1st year secondary school students. This group was chosen mainly because research has shown that oral diseases are prevalent at this age and, furthermore, that they are most open to oral health promotion activities.

The oral health services and promotion programme consists of the following elements:

1. examination of the students to identify individuals who need care;
2. oral health promotion activities in class and on an individual basis;
3. provision of preventive oral health measures like sealing the tooth surfaces, using glass-ionomer cement, and removing hard deposits from the tooth surface;
4. provision of treatment for tooth decay, using the ART technique;
5. discussions with the school staff on maintaining good oral health in the schoolchildren after the team has left;
6. evaluation of the programme in general and the care provided over the year.

The programme started in March 1993 in six secondary schools in the Greater Harare area. Among 572 children examined, 553 required some form of preventive or curative attention. The programme is carried out by two dentists and two newly qualified dental therapists, and is being incorporated in the teaching of third-year dental therapy students. The latter assist the operators, give oral health education, and carry out the removal of hard deposits on the tooth surfaces.

So far, this procedure has been well received by school staff and students, the vast majority of whom were very pleased with the care they received which otherwise they would never have had. Eventually, the programme aims at providing improved oral health care which will be sustainable in terms of quality and durability as well as affordable and acceptable by the people, and which can be brought to them at low cost to the government. ■

Oral health promotion among children in Madagascar: prevention is always better than cure.

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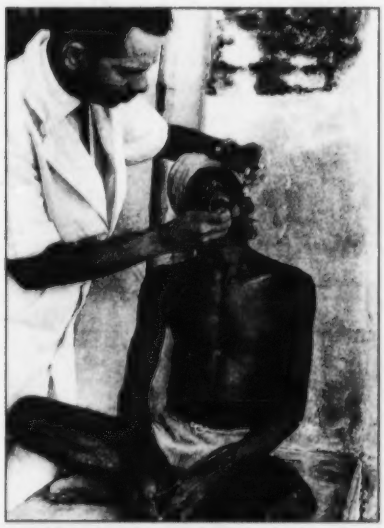
A family care programme in India

Amrit Tewari



In India, as in many countries, dental caries is on the increase.

Soluble tablets of sodium fluoride offer a low-cost means of providing the rural populations in developing countries with a simple mouthwash that can protect their teeth from dental caries.

Dental caries (tooth decay) and gum diseases are the two most common oral health problems in human beings. Caries has a worldwide distribution. It is caused by bacteria which are normally present in the mouth sticking to the teeth in a concentrated form with the help of a thin slimy layer called dental plaque. When an individual takes foods with fermentable carbohydrates (fruits, milk sugars as well as sucrose and some starches), these germs start to make acid by action on the carbohydrate in the foods:

Plaque bacteria + fermentable carbohydrate → Acid

Acid + tooth enamel → Cavity

The more often a person takes each day foods or drinks with fermentable carbohydrate, the more opportunities occur for the acid produced to cause cavities in the teeth. Fluoride helps to prevent cavities by strengthening the teeth and weakening the bacterial action.

Until 1980 dental caries severely affected most of the population in the developed countries where levels as high as twelve teeth were found to be decayed in children aged between 12 and 15. But since 1980, it has been controlled in most Western countries – e.g., Denmark, Netherlands, Norway, Sweden, United Kingdom and the United States – and also in some others – Australia, Hong Kong, New Zealand, and Singapore – where the distribution of decayed teeth has been brought down to as low as one to two per 12-year-old child. This is mainly due to the appropriate use of fluorides and oral hygiene measures, especially brushing with fluoridated toothpaste.

In developing countries such as Bangladesh, India, Nepal, and Sri Lanka, the incidence of dental caries used to be comparatively low, but now has been found to be on the increase. This is primarily due to the fact that organized preventive measures have not been initiated, priority being given to diseases with high mortality and high morbidity or to curative and restorative services. In the rural areas of most of these countries, the dentist to population ratio may be as low as 1:300 000.

Since there is hardly any oral health cover for the rural communities, what can be done to prevent the steady increase in dental caries? The answer springs to mind: "Why don't they brush their teeth with fluoride toothpaste?" Most people living in rural areas of India cannot afford the money to buy a toothbrush and fluoride toothpaste, which for a family of four would mean an expenditure of 60 rupees (US$ 2) per month. This difficulty came to the fore when a demonstration module for primary prevention of oral diseases in rural India was being prepared, involving 120 000 people who had no access to any professional oral health care. As application of fluoride to the teeth every day in low concentrations has been so effective in preventing dental caries, a cheap and easy-to-use method was devised as an alternative through rinsing with soluble sodium fluoride tablets.

Fluoriwash packets

These tablets are known by the name of "fluoriwash"; they contain 10 mg of sodium fluoride (4.4 mg of fluoride), and are available in packets of 30 tablets. One tablet, when dissolved in five teaspoonfuls (25 ml) of cold, clean water in a plastic cup,

makes a fluoride solution with a concentration of 0.04% sodium fluoride. The cost of one packet was Rs 1.25 five years ago and Rs 4 (US$ 0.12) today. This pack is sufficient for a family of four (two adults and two children) to do a daily fluoride mouth rinse for a full month; the cost proved to be easily affordable by rural people. The community was advised to dissolve one fluoriwash tablet in a plastic cup with the help of a plastic spoon every night before retiring to bed. They should put one to one and a half teaspoonfuls of solution in the mouth of each family member, who should swish for two minutes and then spit. To have the maximum beneficial effect, they should go to sleep without further washing their mouth; in any case, they should not drink anything for at least two or three hours. As there are hardly any chemist's shops in the small villages of India, these packets of fluoriwash tablets were made available to the community through the shops of ordinary traders selling groceries.

Such low-cost preventive programmes, as described here, can be practised by families in the rural areas of any country where the use of a toothbrush and fluoride toothpaste would be too expensive. As to cleaning their teeth, these population groups could and do use tree twigs as chewing sticks in place of a toothbrush. ■

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Father prepares the fluoride sodium solution . . .

. . . and shows the children how to rinse their mouths.

Prevention at a low cost

Oral care is costly. Some rich countries spend 5% to 11% of their annual health budgets on oral health. It is a price that few Third World countries, if any, can afford to pay.

Prevention rather than repair – and repair when problems do arise – are the real answers. It is estimated that prevention takes much less time and money than treatment *and* it is better!

Oral health care personnel, such as "dental therapists" or "dental hygienists", can be trained in two to three years. They undertake oral health promotion and education. They also have the skills to clean teeth, remove tartar deposits, fill cavities and perform ordinary extractions. Dentists can then concentrate on more difficult treatment and carry the overall responsibility for oral health care programmes.

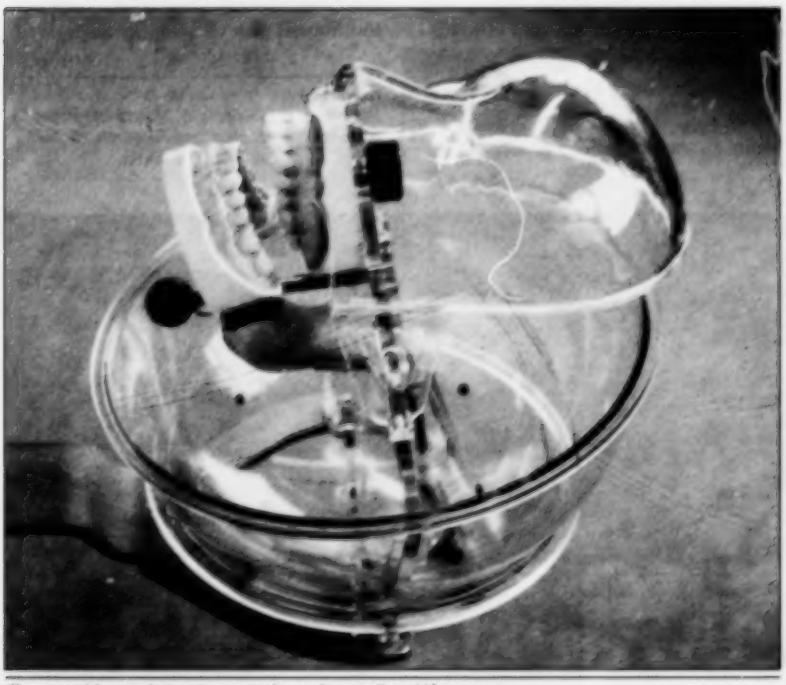
There is a ratio of one dentist for every 1000 population in several rich countries; but only one for over a million people in some poor nations. When proper mouth care, including prevention, is promoted, these ratios should improve significantly.

Oral health, however, does not depend only on oral health care personnel. It is first and foremost a personal and family responsibility. Children should be brought to a health worker trained in oral care as early as possible. They should learn very early about oral hygiene when they learn about body hygiene, preferably by two years of age. By six years, when the permanent teeth – the teeth for life – are growing, they should have established good oral habits. Parents should take the responsibility for cleaning children's teeth, up to the age of eight years.

The experience of a number of industrialized countries has shown that the cavities dropped by about 80% in the last 20 years as a result of a combination of preventive measures – including health education and information programmes advocating oral hygiene, the optimal use of fluorides, and "prudent" diets. Indeed, it can be said that cleaning teeth and gums, using fluorides, and eating fermentable carbohydrates with meals rather than between meals are the "pillars of prevention".

Alternative approach to oral community care

Ewen E. J. Kirk



This portable simulator can reproduce almost all real-life situations.

The need for oral care is changing. Demand will be greatest when communities perceive services to be rational, affordable, accessible and appropriate.

The success of caries prevention through fluoridation during the past two decades has shown that the major dental afflictions (caries, gum disease and most oral cancers) are related to lifestyle and that while oral status is improving in the developed countries, the majority of the world's population – who are rapidly becoming urban dwellers – are still threatened. The cost of oral care is a problem for even the richest countries; high costs and lack of access are either an actual or potential burden for all developing countries. At present, oral health care is provided by private dentists or by a centrally controlled system aiming at universal access. Both systems are flawed.

Is there an alternative? Very definitely, yes! There is sufficient experience within WHO and its collaborating centres, the universities, and governmental as well as nongovernmental organizations of an approach that will radically lower the costs and improve access and the quality of oral care for worldwide populations. This alternative is described below.

Rationalizing the curriculum

The dominant expense in all oral health care systems relates to personnel costs. As the characteristics of national health delivery systems are fixed by legislation, those involved in such legislation should increasingly recognize that the promotional, preventive and treatment requirements of oral health care can be divided into high- and low-technology components. These should be serviced by people trained to different levels of performance.

However, at every level the courses and curricula that are being actively developed share certain characteristics. They should be derived after situation analysis; they should be problem-focused; they should demand active, often interactive, responses from learners; and the outcomes should be able to be evaluated in terms of knowledge, performance and behaviour. They should also be available in sufficient detail, in written or recorded form, for learners to clearly comprehend their tasks. In short, the courses offered in many countries should be recast to facilitate and empower the learner. The best format for this is to use modules with interactive capabilities.

Using simulation

Much work in prevention and treatment in oral care involves simultaneous problem-solving and physical action. Although preclinical courses using phantom-heads are common, there are few courses that use simulation, i.e., the mimicking of reality, to develop exact processes and performance that will be needed in clinical practice. Simulation facilitates

the mastery of the exact skills a clinician will require. After two international conferences the development of simulation theory is accelerating in universities in Canada, New Zealand and the USA. It has also been used in the intercountry centres of Nigeria, Syria and Thailand. Appropriate simulators are being developed and recognized as powerful educational tools. The ability to learn more easily, more quickly, and to a higher standard is evident at every level of training and brings simulation objectivity into evaluation of performance.

Simulation assists the clinician to acquire the exact skills required.

Simplifying delivery

Because simplification has meant so often the limitation of scope or the reduction of quality in oral health care, the thrust of the WHO Expert Group on Equipment and Material for Oral Care has been viewed with some doubt in high technology situations. In spite of several false starts and extremely limited resources, there are now methods of analysing physical requirements in the delivery of oral care so that settings can be designed to facilitate and enhance quality performance. A logic for performance (performance logic) has been developed and good ergonometric practices have been adopted. By combining sophisticated concepts with quality equipment for rationalized procedures, great reductions in costs of settings can be made. Simplifications target three imperatives.

- Economic, with reductions of the order of one-tenth of previous costs.
- Educational, allowing the halving of learning times or the consolidation of better skills.
- Health, giving easier control over cross-infection.

Beyond this, the separation of primary and more complex referral centres allows community placement of centres of first contact at very low costs. A remarkable range of preventive and treatment procedures can be carried out at the primary centres.

Precise skills and simplified delivery.

Everybody gains

Simplified systems and settings can dramatically improve and extend access to different levels of oral care. The potential result of this approach is:

- better targeting of training and education will ensure that the hard-won knowledge and skills acquired by learners are relevant to current and future problems;
- better educational methods and technologies will empower learners and motivate teachers so that quality care becomes easier to deliver and monitor;
- reduced capital costs will benefit both providers and consumers.

Why hasn't it happened?

A pessimist would say that the barriers to change are ones that place national, organizational, institutional and group loyalties above rational benefit to communities. An optimist will say change is already happening; the power of networked knowledge has already released educational methodologies and management strategies that will fundamentally change the delivery of oral health care for the good of all involved!

It requires commitment at many levels to gain maximum benefit from the changes that can now be planned. Before planners and policy-makers can act, they must understand the interdependent nature of many of the issues and, in particular, the importance of settings in training and delivery of oral care. Comprehensive prevention-based care calls for teams of appropriately trained people, working in conditions designed to facilitate their work.

The need for oral care is changing. Demand will be greatest when communities perceive services to be rational, affordable, accessible and appropriate. ■

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Early diagnosis

Jens J. Pindborg

Oral precancer and cancer

Most cases of oral cancer are preceded by a precancer, either in the form of a white patch (leukoplakia) or, very rarely, a red patch (erythroplasia). These lesions are very easy to detect clinically, so dentists have a prominent role in recognizing them before they develop into cancer, thereby contributing to the prevention of oral cancer. WHO has estimated that about 80% of all oral cancers are preventable.

We know that the important etiological factors are tobacco usage and alcohol. The white precancerous lesion, called leukoplakia, is most often caused by tobacco usage – either chewing tobacco (in southern and south-east Asia often also associated with betel chewing) or smoking. In most cases the leukoplakias are located on the tongue or the mucous membrane of the cheeks, lips or gums.

Whether the use of smokeless tobacco is a dangerous habit which can lead to the development of oral cancer is a much-discussed issue. Studies of baseball players in the United States, who often use smokeless tobacco, did not show precancerous changes under histological examination, but there were periodontal changes. Furthermore, it has been demonstrated that snuff placed between the cheek and the teeth causes a high absorption of nicotine that is measurable in the blood. Sometimes cases of leukoplakia have been observed in persons, especially women, who are not users of tobacco. These leukoplakias have no known cause.

HIV infection

When AIDS was recognized as a disease in 1981, the first report mentioned that several of the patients had oral lesions, especially in the form of a fungal infection called candidiasis. After oral candidiasis was identified in these patients, it became a challenge to the dental profession to detect the early stages in the infection by identifying small and often very inconspicuous lesions as manifestations of candidiasis. These are frequently red, called erythematous candidiasis, and may be the first signs of the disease. The dentist therefore has a tremendous responsibility for identifying HIV infection at an early stage.

How can the dentist contribute to an early diagnosis of oral cancer and of HIV infection?

The gums or gingiva may also show changes which can be used to diagnose HIV infection. In times of war, military personnel often suffered from a special type of gum disease called necrotizing gingivitis. After the Second World War this disease regressed considerably in the industrialized countries, but has been reappearing with AIDS. Many cases of HIV infection can be identified through necrotizing gingivitis. The diagnosis of AIDS can also be made on the basis of a bluish-red lesion on the palate or gingiva, called Kaposi's sarcoma.

It is important for a dentist to perform a thorough examination of the oral mucosa in order to exclude diseases from which a patient could die. It may often prove necessary to contact other specialists in such disciplines as cancer, dermatology, ear, nose and throat diseases, and general medicine. ■

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Noma – a neglected Third World disease

Cyril O. Enwonwu

Every year there are half a million new cases of noma, a hideous disease which particularly attacks children and can result in severe facial mutilation. Early detection and prevention are essential.

Noma, derived from the Greek work *nemein* meaning "to devour", is a severe, gangrenous lesion of the soft and hard tissues of the mouth and face. Also known as cancrum oris, this devastating disease begins as an ulcer in the gum around the teeth. In a matter of days it spreads to the cheek, chin, palate, nose and virtually any part of the oral cavity and surrounding structures, often leaving a gaping hole in the face. When it reaches this state, the death rate is high; those who survive will have one or more of the conditions of facial mutilation, impaired growth of the facial skeleton, nasal regurgitation of food, leakage of saliva, defective speech and chewing difficulties. The earliest perceptible signs are excessive salivation, marked bad breath, and facial swelling.

Noma is virtually unknown today in the industrialized countries, but still occurs frequently in the Third World where it is a socioeconomic disease encountered predominantly in underprivileged children aged between two and six years. It appears to be increasing at a rapid rate in developing countries, particularly in sub-Saharan Africa, and there are estimated to be no fewer than 500 000 new cases globally each year.

The risk factors for noma include poverty, malnutrition (particularly protein-energy malnutrition (PEM) and vitamin-A deficiency), heavy microbial contamination of drinking-water and weaning foods, poor oral hygiene, and debilitation resulting particularly from malaria and the eruptive fevers of childhood. Malnutrition in sub-Saharan Africa is at present of staggering magnitude, and is getting worse in many countries. Malnutrition not only reduces immunity to infections but also acts jointly with such infections as measles to cause damage to the gum mucosa, leading to ulceration. The latter lowers resistance to invasion by the suspected causative microorganisms of noma (bacteroides, fusobacterium or treponema), which usually have little ability to invade intact epithelium. The observed increasing frequencies in Africa of noma and the lesion that is presumed to precede it, acute necrotizing gingivitis, may also be related in part to the HIV/AIDS epidemic in the continent.

Adequate nutrition

Management of patients in the acute stage of noma should emphasize adequate nutrition; correction of dehydration and electrolyte imbalance; appropriate drug therapy, including antibiotics (penicillin and metronidazole are very effective) and antimalarials if indicated; and local wound care. Surgical repair of the resulting deformity should follow after the infection is under control. Apart from the huge expense of reconstructive surgery, the results in terms of quality of life for the victim are not always satisfactory.

Early detection and prevention of this hideous disease are therefore essential. Routine mouth examination should form an important part of the primary health care of children at risk of the disease. In such children, oral mucosal ulcers, particularly acute necrotizing gingivitis, should be viewed as potential noma. Adequate nutrition, proper oral hygiene practices and improved living conditions are key preventive measures.

Noma is an escalating and neglected public health problem that robs many children of their future. It is a disease ripe for carefully planned international collaborative studies which will define more accurately the magnitude of the problem in various countries, the key risk factors, the precise biological causes of the lesion as well as the pathophysiological processes involved and – most importantly – effective interventions against the disease. ■

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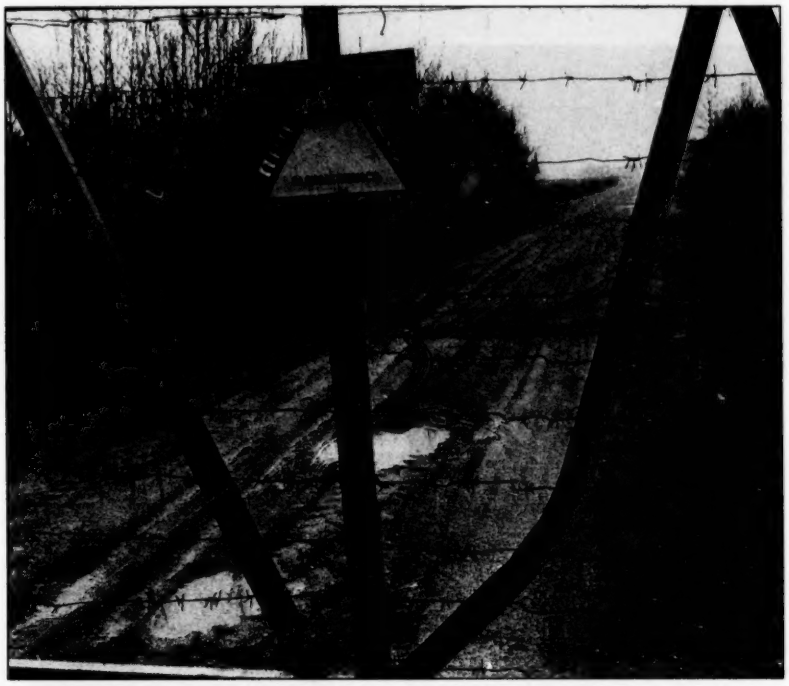
Chernobyl "fall-out" on oral health

P. A. Leous

Poor oral hygiene, high prevalence of periodontal disease, and lack of dental services are current features of oral health among people living in areas of Belarus contaminated by the Chernobyl nuclear accident.



Danger zone! A huge task awaits the health services at Belarus.

The state of oral health was the least of the worries of the population who found themselves in a radioactive zone after the Chernobyl nuclear power station disaster in 1986. In fact, the first teams of dentists from the Minsk Medical Institute who arrived at strictly controlled areas of Belarus several days after the accident had no evidence of any specific oral health problems among the population. Furthermore, through lack of information, the dental scientists had little interest in the after-effects on oral health, although some studies on the effect of low radiation on oral and dental structures were conducted under laboratory conditions at the Paedodontics and Oral Surgery Departments. Published in local journals, these studies showed different kinds of pathological effect to the jaw bones and soft oral tissues.

Since then there has been growing concern about the sharp increase in the incidence of thyroid cancer observed among children in contaminated areas of Belarus. Between 1986 and 1991, 131 cases were diagnosed compared with only seven cases over the same period of time before the accident. More than 50% of these cancers were found in Gomel Oblast. In 1992, 67 cases were reported. A considerable growth in thyroid disorders such as autoimmune thyroiditis has also been reported among children in contaminated areas.

Systematic continuous studies of the oral health status in affected areas were revived in 1990–91. Their main purpose was to assess oral health in different age groups of the population living in strictly controlled zones. An oral health project, which started late in 1992 as part of the International Programme on the Health Effects of the Chernobyl Accident, aims to improve diagnostic and curative services in oral health in contaminated areas of Belarus. Samples of tooth enamel collected will be used for individual dosimetry by electron spin resonance spectrometry.

WHO's standard oral health survey methods were used for oral examinations which highlighted several risk factors or cofactors of oral disease. For dental caries, salivary function, oral hygiene, fluoride intake and other dietary components came under study and, for periodontal disease, the immune status and oral hygiene. About 5000 people of all age groups underwent examination.

Poor oral hygiene

There was an obvious deterioration in the oral health status of the surveyed population. The latest data showed moderate to high levels of dental caries, a high level of periodontal disease, and an increasing proportion of oral mucosal diseases. The average number of decayed, missing, or filled (DMF) teeth varied from 4.6 in 15-year-old children to 19.6 in the over-

65-year-old age group. Oral hygiene was poor. The food patterns have changed towards more refined products and sweets, which are delivered from safe neighbouring regions and from abroad.

Several international studies have shown that the intake of radionuclides in foodstuffs is a growing risk factor. From 3923 samples of different types of food measured in the Gomel Oblast area between April and December 1992, an excess of radioactive caesium was detected in 56 cases.

The prevalence of gingivitis and/or periodontitis, which was almost 100% in teenagers and the adult population, coincided with the lack of regular oral hygiene practices. The most frequent complaint was gum bleeding and dryness of the mouth. The latter condition was observed in 12% of 18-year-olds, 29% in the 35-44 age group, and 86% in 65-year-olds, compared with 3%, 20%, and 33% respectively in similar age groups surveyed in non-contaminated regions of the country. About 17% of the surveyed population had some abnormality or oral mucosa lesions compared with 10% in non-contaminated areas.

Oral health services for the population in contaminated areas were inadequate or poor, due to the shortage of dentists, dental equipment and materials, and 50% or more of decayed teeth were unfilled. On average, five teeth were extracted from every ten teenagers aged 15 years. In adults, few teeth were filled and most were extracted, although average DMF teeth were the same as in non-contaminated zones.

In sum, we found a high prevalence of the common oral health diseases, poor oral hygiene and poor care among the two million people living in contaminated areas of Belarus. To date, only a small proportion of the population has moved to non-contaminated areas.

Thyroid cancer gives concern

Observations on the increase of some oral diseases in contaminated zones due to radiation are questionable, since no precise records were available in the area before the Chernobyl disaster. No possible side-effects of prolonged low doses of radiation on oral structures have been reported. Nevertheless, the incidence of thyroid cancer among children remains a major concern today for the health authorities in Belarus.

Hard dental tissue, particularly tooth enamel, is accumulating radioactivity and – with time – it could have a potential pathogenic effect on oral biology. There are also signs of the development of gastroduodenal pathology and an increase of thyroid diseases, certain haematological diseases and disturbances of the immune system. All these conditions could seriously affect the oral health situation due to local pathogenic factors, the shortage of services and lack of primary prevention.

Careful tooth-brushing is effective in reducing the prevalence of periodontal disease, but oral hygiene is poor and has certainly contributed to the periodontal conditions observed. Lack of oral hygiene aids and the extremely low motivation of the population are the main obstacles to the introduction of a proper, regular, effective oral hygiene programme. In conjunction with oral hygiene education and instruction, it would be necessary to use local anti-inflammatory substances both through self-care and with professional help.

As yet we have insufficient evidence to predict specific levels of dental/oral disease in the areas studied. However, the following oral health problems can be expected: severe periodontal diseases due to poor oral hygiene, loss of teeth due to lack of oral health services, enamel hypoplasia due to dietary imbalance, and oral mucosal lesions as symptoms of poor general health. ■

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An electronic curriculum?

Diarmuid B. Shanley

Primary care workers could benefit greatly from computerized education.

Oral health could be the subject of a pilot scheme for developing an international multimedia core curriculum in the health sciences, using electronic communication systems to fill gaps in current curricula.

Interactive multimedia programmes have considerable potential for education in the health sciences. Unfortunately, because international cooperation is lacking, these programmes have been needlessly duplicated and those that are widely available are not necessarily the better ones. In some, the technology has become more important than the educational objectives, while others are simply promotions for products or for centres of education.

In order to make the best use of multimedia communication systems, we need to develop a catalogue of electronically-based interactive training programmes. These could be easily exchanged and would be of use both in developing and developed countries. Such a catalogue would require international collaboration and would promote international convergence towards higher standards of health training and care. Dr David Barmes, Chief Dental Officer of WHO, has referred to this concept as the development of an "electronic curriculum".

Before such an ambitious international project could be set in motion, the fundamental objectives of education in the health sciences should be agreed. Taking oral health as a pilot scheme, it should be possible to identify objectives based on the essential knowledge and proficiency needed by health workers delivering primary care.

Some very basic aims might help to initiate discussion on more detailed educational objectives at the international level. The following are examples of some fundamental abilities that should be required of a future dentist (or "oral physician"):

- understanding the basic biological, behavioural and medical sciences on which oral health maintenance and care should be based;
- practising dentistry in the context of whole patient care without harm to the patient or the environment;
- taking a proper medical history, examining a patient, diagnosing oral and dental diseases, and formulating and carrying out appropriate treatment;
- knowing the demographic features of common oral diseases and setting attainable targets in community health programmes.

Curriculum for oral health workers

These are only basic examples of educational aims, and should first be expanded by a broadly based group of international experts and then applied according to regional needs, available resources and treatment demands. Well-established goals should dictate

the curriculum on which a series of multimedia programmes for oral health care workers would be based. If successful, such programmes have the potential to be extended to a core curriculum for the health sciences, and could be used in traditional or problem-based curricula.

In Dublin, we have planned sets of over 40 clusters of programmes for a health science curriculum which are problem-based and clinically orientated, each programme focusing on the clinical problem, whether in oral health or, for instance, concerning the HIV-seropositive patient. Learning is stimulated through related material, some of which (for example, oral manifestations of HIV infection, cross-infection control, medical/dental collaboration in treating the HIV-infected patient, public health principles and study of a global pandemic) provides the essential paraclinical and biological topics necessary for a more thorough appreciation of the central clinical problem. Other topics for learning deal with clinical and pre-clinical subjects (e.g. sexually transmitted diseases, anatomy of the immune system, economics of caring for AIDS patients, etc.), which may be adapted to different needs in different regions. Schools might opt to take some or all of the programmes, either to fill gaps in their curriculum or to supplement it. The benefits to schools where there are serious deficiencies in teaching personnel and resources would be significant.

In theory, an entire curriculum of multimedia programmes could be structured on this modular design but the immediate intention is to supplement existing curricula. Programmes would be based on compatible electronic communication systems and would include interactive videos, computer-assisted learning programmes or simple manuals. Distance learning and satellite communications channels could be further exploited for use in such vast countries as Russia. This development could apply to undergraduate and postgraduate courses and continuing education for practitioners.

High-quality programmes

Collaboration and quality assessment through international peer review would decide which material, already available from centres throughout the world, should be used in such an electronic curriculum.

Recognized international experts in the various subjects would coliaborate to validate objectives and contents in producing new material. It will be essential to promote an interdisciplinary approach in order to exploit, to the full, the skills of experts in communications and the media, and to ensure that the programmes produced are of the highest quality in content and presentation. Technology must not become an end in itself.

The traditional curriculum in both medicine and dentistry in many countries has been criticized for its emphasis on irrelevant detail in some of the biological sciences, its lack of emphasis on the behavioural sciences, its failure to address community priorities in health care and its overemphasis on theory. Nevertheless, the education of health care personnel should not be so narrowly based that it merely provides them with utilitarian abilities. Pursuit of knowledge for no other purpose than expanding our understanding of the world in which we live has been the kernel of education from the time of Plato, as described in *The Republic*. Such concepts may be questioned on an economic basis. Nevertheless, if on completion of their training programme the students are left without the means or enthusiasm for exploration and continuing learning, or a critical analytical approach, their educational process may have done more harm than good. Such principles are as important in a world of multimedia technology as they were in Plato's time. ■

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Japanese students undergoing training with the help of a computerized programme.

Lifestyle-related factors

Aulikki Nissinen & Hannu Hausen

Cleaning teeth with a chewstick. Oral hygiene and a sensible diet, through primary health care in all countries, can protect against other diseases.

Coronary heart disease, the most prevalent consequence of atherosclerosis, is closely linked with lifestyle-related factors such as smoking and diet, and these factors are also associated with hypertension, cerebrovascular diseases and diabetes.

Dental caries and periodontitis, which cause tooth loss, are caused by microorganisms but lifestyle factors – including dietary habits, oral hygiene and compliance with prophylactic programmes -- also modify the occurrence and progression of these diseases. Patients with cardiovascular or cerebral infarction have been reported to have poorer oral health status as compared to control subjects, and it has been suggested that chronic oral infection may be associated with myocardial infarction. The atherosclerotic process begins in childhood and youth, because of harmful lifestyles adopted in early life. A recent study reports that adolescents with a high prevalence of caries had a higher average daily intake of energy originating from fat and a lower daily fibre intake than others. In addition, smoking among adolescents has been found to be associated with poor oral health status among Finnish schoolchildren.

Even though the possible common etiology of dental caries and other prevalent chronic diseases has not yet been confirmed, it seems justified to combine preventive action with regard to the cardiovascular diseases, diabetes and dental caries. Based on a concept of the integration of risk factors, WHO has started the InterHealth programme, which seeks to reduce the occurrence of chronic diseases and their lifestyle-related determinants in developed countries and to maintain a low level of these diseases and related lifestyle factors in developing countries.

Back in the 1950s and 1960s practically all Finns were affected by dental caries, and cardiovascular diseases were by far the most important cause of death among the population. Intensive health education was started to improve the level of oral hygiene, and the use of fluorides was introduced mainly in the form of fluoridated toothpastes, as well as supervised fluoride rinsing programmes at schools and dental clinics. School oral health care became an integrated part of the primary health care system in 1972.

Since then, the caries situation among Finnish children has improved significantly. While in 1974 a twelve-year-old had on average 7.3 permanent teeth decayed, missing due to caries, or filled, the corresponding figure was 1.2 in 1991. It is impossible to assess the exact contribution made by the different components of the oral health programme, but it is likely that most of the improvement is due to the ubiquitous exposure of the population to fluorides, especially fluoridated toothpastes.

There has also been a reduction in the occurrence of cardiovascular diseases, the prevention of which is also based largely on activities within the municipal primary health care system as well as within occupational and school health care. Even though the prevention of both oral diseases and other chronic diseases is an integral part of the primary health care system, the fact is that so far these activities have been run more or less separately in Finland and there is still a long way to go before these activities are truly integrated. Certainly the evidence suggests that, in all countries, it is highly desirable for efforts to promote and maintain oral health to be combined from the very beginning with efforts to control other lifestyle-related health problems. ■

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WHO in action

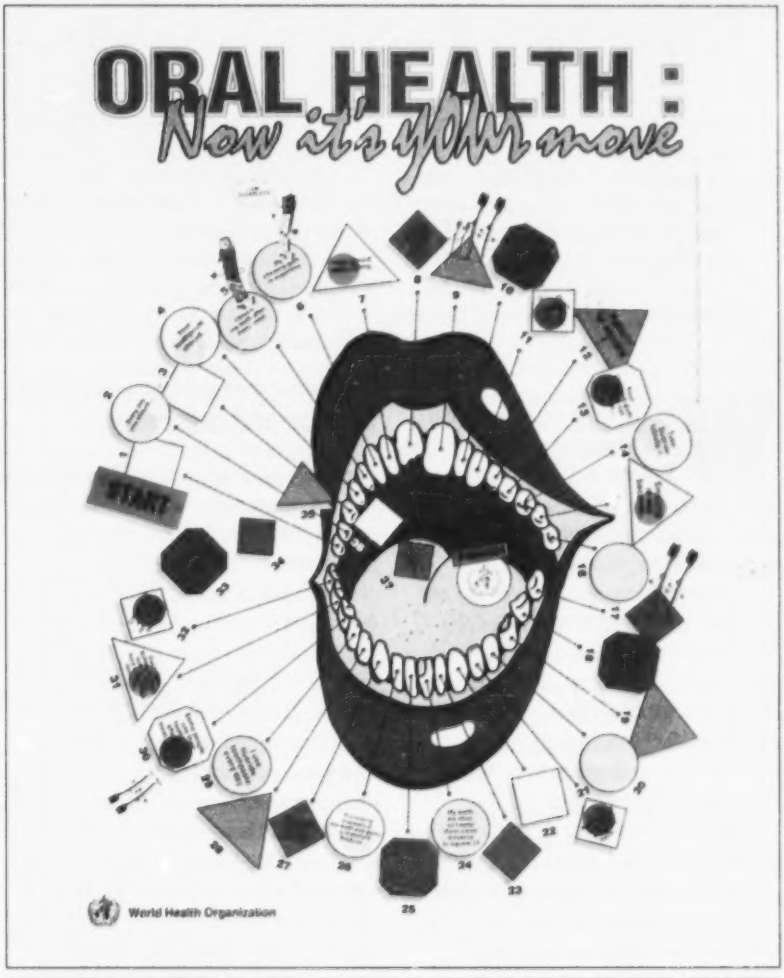
Now it's your move

Oral health contributes to a healthy life. Worldwide, oral health has improved greatly in the last decades, although there is still much to be done. And there is a lot that each one of us can do to protect our teeth and keep our mouth healthy. We can learn what this is, or refresh our memory about what we already know, by playing the 1994 World Health Day Game, illustrated on the right of this page.

After tossing the dice, players move a counter across the board over the different coloured spaces, which will either give them a message or refer them to a "message sheet". These messages should be read aloud, so everybody around the table will be able to learn something at each move of the game. Some are fairly straightforward: "Every day, you should clean your teeth with a toothbrush, or a chewing stick, to keep your teeth and gums healthy". Others state facts that very few people have heard about: "Open your mouth and look carefully at your teeth: how many are Decayed, how many are Missing and how many have Fillings?" Add together the number of your D(ecayed) teeth, your M(issing) teeth and your F(illed) teeth. WHO has set a goal for children; no more than three DMF teeth at 12 years of age. And, finally, some messages are really good news: "Preventing diseases of the teeth and gums is important. Reductions in tooth decay, reaching 80%, have been achieved."

Playing this game will be fun and instructive, and it will provoke group discussion in the classroom or between friends.

To obtain the game, please print clearly your name and full address on a photocopy of the form under the picture, and send it to the World Health Organization, Office of Information, 1211 Geneva 27, Switzerland.



The Oral Health Game devised for World Health Day – 7 April 1994 – with the slogan "Oral health for a healthy life".

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The smile – a global language

Harald Löe

This young patient needed multiple surgery to repair her cleft lip and palate.

What is more universal than the beauty of a smile? From Boston to Beijing, from Caracas to Cairo, a smile on a person's face speaks the common language of happiness and hope.

Unfortunately, the ravages of oral diseases are also part of a language too easily understood – that of poor oral health. A glimpse of broken, blackened, or missing teeth, sunken cheeks or facial deformities can be seen in varying degrees in people from almost any nation.

The National Institute of Dental Research (NIDR), a part of the United States' National Institutes of Health (NIH), recognizes the need for international cooperation in dealing with the worldwide problems of oral disease. Because the problems and their solutions are beyond the resources of any one agency or country, the only way to bring oral health up to an acceptable level worldwide is to pool international knowledge and resources. As the WHO Collaborating Centre for Epidemiology, Prevention and Treatment of Oral Diseases and Conditions, the NIDR – in concert with the international oral health community – has identified five major oral health problems that would most benefit from shared international research, resources, and expertise: oral cancer, noma, craniofacial malformations, oral effects of HIV infection, and assured optimal use of fluorides.

Disease and deformity

Certainly a coordinated global effort is needed to improve our understanding of oral cancer and its prevention, diagnosis, and treatment. An article elsewhere in this issue deals with noma, a devastating ulcer-like disease of the face and mouth seen frequently in poor children aged between two and six in deprived communities.

International research is also focused on craniofacial malformations, particularly cleft lip and palate. These head and face defects are among the most common, occurring in one in every 600 live births. The incidence is highest among Asians, and genes responsible for several forms of clefting are being found in American, Chinese, Danish, Hawaiian and Icelandic populations. Craniofacial defects can be devastating emotionally for children and their families. Furthermore, treatment is expensive and does not always correct the problems. International studies of populations at high risk may hold the key to understanding these defective genes and the role played by environmental factors.

Increasing knowledge of the oral effects of HIV infection is an essential part of the global effort to treat and ultimately prevent AIDS. Only an international effort that marshalls the best of both the oral health and medical sciences can lead to solid breakthroughs against this disease.

Fluoride is considered the cornerstone of public health measures to reduce the prevalence of tooth decay, a disease that is endemic throughout the world. Now an international effort is needed to devise ways to measure fluoride uptake in the body and to assess the biological effects of fluoride from multiple sources. This information will help scientists to determine the best levels of fluoride needed by various populations to protect against tooth decay.

No programme or project, however technically accurate it may be, can succeed without an understanding of and respect for local priorities, traditions, and ethnic subtleties. Through international cooperation, each of these research efforts has the potential to pay off handsomely in better, or simpler, means of oral disease treatment and prevention that will find acceptance throughout the world. ■

Dr Harald Löe is Director of the National Institute of Dental Research, National Institutes of Health, Bethesda, MD 20892, USA.

Dentistry, the "Cinderella" of medicine

What applies to medical care in general is certainly true of oral health care in particular: how to deliver a comprehensive, effective service to the whole population at a price the government can afford; how to measure its effectiveness and how to ensure that the service can be adapted quickly to respond to changing needs.

However, the delivery of oral health care also appears to have problems that have already been resolved in many other areas of health care – in the United Kingdom, for example. In surveys about health, oral health is more likely to be excluded than included, or is treated as a separate issue. Young children receive considerable benefit from preventive health measures such as vaccination and immunization, or monitoring of their hearing, sight and physical development. This early care is not given to their mouth and teeth to anything like the same extent.

Each year there are 15 million more teeth to be looked after. Yet despite the consequent changes in the patterns of necessary oral health care, the oral health services have scarcely changed since they were set up as part of the National Health Service in 1948. Figures collected by the British government show that up to about 80% of "items of service" now largely carried out by dentists could in principle be carried out by properly trained auxiliaries, less highly trained and less expensively employed than dentists.

Auxiliaries are probably also the key to the service becoming more oriented towards prevention by giving oral health advice and help. Many routine examinations could be carried out by auxiliary staff, providing the data on which dentists could base treatment planning. Some extractions and some fillings are already within the province of dental therapists, and much of the work involved in making complete dentures, both clinical and technical, can be carried out by clinical dental technicians, judging by experience in many countries. More generally, it seems many of the services for children, the elderly, the ill and the disabled could be provided both well and cost-effectively by auxiliaries.

Too few dental auxiliaries?

In most of medicine, the ratio of auxiliaries to doctors is high and the service is relatively cost-effective as a result. The United Kingdom's 89 000 doctors are supported by about 700 000 of the "professions allied to medicine" – for example, nurses, midwives, and radiographers – an average of eight auxiliaries to each doctor. By comparison, 23 000 dentists work with fewer than 40 000 auxiliaries – well under two auxiliaries per dentist.

A report prepared by the Nuffield Foundation in London, entitled *The education and training of personnel auxiliary to dentistry*, suggests that the way forward is for dentistry to become more a part of medicine; for dentists to be more like doctors; and for the "machinery" of primary care to embrace dentistry for young children and, where necessary, elderly and disabled people and those who are otherwise disadvantaged. These moves should meet the problems of the proper and cost-effective employment of auxiliaries, of their education, training and regulation, and of their effectiveness being adequately researched and monitored. ■

Contributed by The Nuffield Foundation, 28 Bedford Square, London WC1B 3EG, England, from where the report is available (£10 including postage).

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In the next issue

Current events and problems in life have deep repercussions on our mental well-being, which in turn influences our physical health. The March-April 1994 issue of *World Health* looks at different ways in which stress and psychosocial factors can determine the health status of individuals. ■

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